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ORIGINAL ARTICLE

Posterior pelvic pain provocation test is negative in patients with lumbar herniated discs

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Abstract The classification of pelvic girdle pain can only be reached after lumbar causes have been excluded by a clinical examination. During clinical examination, the posterior pelvic pain provocation test is a well-established method for verifying pelvic girdle pain. However, a criticism of pelvic pain provocation tests is that they may have an effect on lumbar structures, thus yielding false-positive results. The posterior pelvic pain provocation test was performed with four groups of patients: patients with computed tomography-verified disc herniations (1) on the waiting list for surgery (14 women; 9 men); (2) 6 weeks after disc surgery (18 women, 12 men); (3) pregnant women seeking care for pelvic girdle pain ($n = 25$); and (4) women with persistent pelvic girdle pain after delivery ($n = 32$). The sensitivity of the posterior pelvic pain provocation test was 0.88 and the specificity was 0.89. The positive predictive value was 0.89 and the negative predictive value was 0.87. Analysis of only women showed similar results. In our study, the posterior pelvic pain provocation test was negative in patients with a well-defined lumbar diagnosis of lumbar disc herniation, both before and after disc surgery. Our results are an important step toward the more accurate classification of lumbopelvic pain.

Keywords The posterior pelvic pain provocation test · Sensitivity · Specificity · Predictive value of tests · Low back pain

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Introduction

As many as 45% of women experience lumbopelvic pain during pregnancy, while 25% experience it after delivery [27]. One subgroup of lumbopelvic pain [pelvic girdle pain (PGP)] frequently begin during pregnancy or within the first 3 weeks following delivery [15]. PGP is mostly experienced between the posterior iliac crest and the gluteal fold, and occurs predominantly near the sacroiliac joints, potentially radiating to the posterior thigh. Pain can also be experienced simultaneously or exclusively in the symphysis [25]. Lumbar pain originates in the lumbar spine region and may present as pain radiating down the leg, but it does not appear to be heavily influenced by pregnancy [8, 20]. Due to the differences in their clinical presentations [8, 9, 19, 22] and the most likely requirement for specific management of each syndrome, it is important to differentiate between PGP and lumbar pain.

PGP can be classified conclusively only after lumbar causes have been excluded [25]. Previous methods used to identify pregnancy-related lumbopelvic pain have included interviews [4, 7]; pain drawings [15, 17]; and a combination of methods, including clinical examination [1, 6, 12, 22]. As part of a clinical examination, a well-established method for classifying PGP is the posterior pelvic pain provocation test, which is reported to have a high sensitivity and specificity [1, 18], as well as substantial kappa values of 0.70–0.76

[1, 21]. A criticism of pelvic pain provocation tests is that they may affect lumbar structures, leading to false-positive results [13].

The etiology of PGP is unknown. The structures thought to be provoked by provocation tests are not defined. Although there is no accepted gold standard against which to compare test results, there are consensus guidelines regarding the characteristics of PGP [25].

The aim of this study was to evaluate the results of the posterior pelvic pain provocation test from two groups of patients: those with a well-defined lumbar diagnosis and those with pelvic girdle pain during pregnancy and persistent PGP postpartum.

Materials and methods

Participants

Data collection was performed from February to July 2000. Study participants were recruited from Västra Frölunda Specialist Hospital and placed into one of four different patient groups. The first control group contained all patients with one or more computed tomography (CT)-verified disc herniations, who were on the waiting list for surgery. The second control group contained patients who had undergone surgery for disc herniation that had been verified by CT. The experienced orthopedic surgeon, who assessed the indications for surgery and performed all of the operations, was not involved in the study. The posterior pelvic pain provocation test was performed on these patients 6 weeks after the surgery. The third group of patients consisted of pregnant women seeking treatment for PGP at the hospital's physical therapy department. The fourth study group contained women who had been classified with persistent PGP after delivery.

The inclusion criteria for all four groups were: fluency in Swedish; women seeking treatment for PGP had to produce a pain drawing indicating pain in the gluteal region with or without radiation down the leg; and a typical PGP history.

The exclusion criteria for all of the groups were a combination of nonspecific lumbar pain and PGP, hip disorders, symphysiolysis, systemic locomotor system disease, history of neoplasm or other severe pathology related to the spine, mental illness or if the patients could not be in the test position due to stiffness or too much pain. Further exclusion criteria for pregnant women were obstetric complications.

All of the patients on the waiting list for surgery and those who had already undergone disc surgery were informed of the study and gave their informed consent. For the pregnant women and postpartum women, the test was part of the standard clinical examination at the hospital.

The posterior pelvic pain provocation test

Two specially trained physical therapists performed the posterior pelvic pain provocation test (also known as the "4P test") [18]. The test was performed with the participants in the supine position with 90° of flexion in the hip and knee on the side being tested. The physical therapist stabilized the contralateral side of the pelvis over the superior anterior iliac spine and applied a light manual pressure to the patient's flexed knee along the longitudinal axis of the femur. The test was positive when the patient felt a familiar well-localized pain deep in the gluteal area on the provoked side. After the test, the patients completed a pain drawing and answered questions regarding age, duration of the present back problem, occurrence of lumbar pain and/or PGP during previous pregnancies, and pain intensity on a visual analog scale. The level of disc herniation was noted in those patients with the condition.

Statistics

The descriptive data regarding nominal and ordinal levels are presented as frequencies. Age is presented as mean values. Pain intensity was primarily regarded as data on the ordinal level and presented as median values, and also as mean values for the purposes of comparison. Sensitivity was calculated as true-positive test results divided by true-positive test results plus false-negative test results. Specificity was computed as true-negative test results divided by true-negative test results plus false-positive test results. Positive predictive value was computed as true-positive test results divided by all positive test results. The negative predictive value was computed as true-negative test results divided by all negative test results [3]. The statistical software package used was SPSS Version 14.0.

Results

In total, 124 patients were potentially eligible for the study during the study period. A total of 24 patients were on the waiting list for disc surgery. One man could not be in the test position; thus, 23 patients (14 nonpregnant women; 9 men) were available for analysis. Thirty patients (18 nonpregnant women; 12 men) had undergone disc surgery 6 weeks previously. Thirty pregnant women were seeking care for PGP; one woman was excluded because she could not be in the test position, and four had not produced a pain drawing with markings corresponding to PGP. Thus, 25 patients were available for analysis in this group. As much as 40 women with persistent PGP after delivery could be included potentially, but eight women were excluded due to suspected disc herniation [1], lumbar pain [1], combined

pelvic girdle and lumbar pain [2], inability to be in the test position [1], mental illness [1], hip problems [1] and other diagnoses [1]. We analyzed the remaining 32 women 10 months (median) after delivery (range 2–192 months).

Within the group with lumbar pain diagnoses on the waiting list for disc surgery, 12 patients had disc herniation at the level L4–L5, three at L5–S1, and one at L3–L4. In seven patients, the disc herniation level was unknown (medical records unavailable). One subject had a second disc herniation at the level L5–S1. Within the group who had undergone surgery, 13 patients had disc herniation at the level L4–L5, ten at L5–S1 and two at L3–L4. In five patients, the disc herniation level was unknown (medical records unavailable). In addition, three patients had a second disc herniation at the level L5–S1, and one subject had a second disc herniation at L4-L5. Descriptive data are presented in Table 1. Posterior pelvic pain provocation test outcomes were independent of where the disc herniations were located.

The sensitivity of the posterior pelvic pain provocation test was 0.88 and the specificity was 0.89. The positive predictive value was 0.89 and the negative predictive value was 0.87 (Table 2). When analyzing only women ($n = 89$), the sensitivity was 0.88, the specificity was 0.91, the positive predictive value was 0.94 and the negative predictive value was 0.81.

Discussion

The principal finding of our study was that the posterior pelvic pain provocation test was negative in a sample of patients with well-defined lumbar diagnosis. The patients with lumbar pain were all CT scanned and diagnosed with lumbar disc herniation. At the department where the present study was performed, there must be a concordance between the clinical picture and the CT findings before a patient is offered surgery. Hence, those patients with lumbar disc herniations should be considered as having a specific and relevant diagnosis.

There is no gold standard against which PGP classification can be verified. In this study, we used PGP characteristics as the criteria for PGP, along with pain markings in the posterior pelvic area on a pain drawing. The present PGP characteristics are well described and have been used as complete or partial criteria for PGP [2, 6, 16]. In addition, the characteristics have been accepted by a group of international experts in PGP, and have been included in the European guidelines for PGP [25].

The two physiotherapists who performed the posterior pelvic pain provocation test specialized in back pain as well as PGP and had been working together for many years. The posterior pelvic pain provocation test is well integrated into daily practice at the clinic and was not implemented specifically for this study. Further, the first publication of the posterior pelvic pain provocation test in 1994 came from this clinic, indicating that this test is well established here.

A possible limitation of this study is that the physiotherapists were aware of those patients who had disc herniations. Ideally, the physiotherapists should have been unaware of the patients' diagnoses.

To our knowledge, the present study represents the first time that the pelvic pain provocation test was performed on

Table 1 Descriptive data of patients in the four classification groups where the posterior pelvic pain provocation test was performed

Descriptive variable (internal missing values in some questions)	Waiting list for disc surgery $n = 23$	≥6 weeks after disc surgery $n = 30$	Pelvic girdle pain in pregnancy $n = 25$	Pelvic girdle pain postpartum $n = 32$
Age, mean years (range)	43 (21–68)	45 (27–63)	29 (19–40)	33 (25–47)
Women	14	18	25	32
Men	9	12		
Duration of back pain (months) *n* (%)				
<1 months	1 (4)		7 (28)	
1–3 months	1 (4)		14 (56)	1 (3)
4 Months–1 year	10 (43)	1 (3)	2 (8)	8 (25)
>1 Year	10 (43)	28 (93)	1 (4)	19 (59)
Back pain in previous pregnancy, *n* (%)				
Yes	2 (9)	4 (13)	15 (60)	28 (88)
No	7 (30)	6 (20)	3 (12)	1 (3)
Not been pregnant	4 (17)	2 (7)	7 (28)	
Do not remember		3 (10)		
Not an applicable question	9 (39)	12 (40)		
No answer	1 (4)	3 (10)		3 (9)
Pain intensity mean highest–lowest value on VAS 0–10 (range)	4.0 (0–10)	3.5 (0–10)	4.8 (0–7.5)	4.5 (0–7.5)

Table 2 Positive and negative posterior pelvic pain provocation test in the four different diagnostics groups

	Waiting list for disc surgery + 6 weeks after disc surgery	Pelvic girdle pain in pregnancy + pelvic girdle pain postpartum	Total
Positive test	3 (1 woman; 2 men) + 3 (2 women;1 man)	22 + 28	56
Negative test	20 (13 women; 7 men) + 27 (16 women; 11 men)	3 + 4	54
Total	23 + 30	25 + 32	110

The number of men within parentheses

a sample of patients with a specific lumbar diagnosis. We identified four previous studies that evaluated the sensitivity and specificity of the posterior pelvic pain provocation test in women with PGP [1, 5, 12, 18]. The test was evaluated against a history of PGP in a consecutive sample of pregnant women over 2 days at a maternity care unit [18]. The same two specialized physiotherapists as in the present study performed the test. The sensitivity of the posterior pelvic pain provocation test was 0.81 and the specificity was 0.80. The positive predictive value was 0.71 and the negative predictive value was 0.88. In three of the studies [1, 5, 12], variations of test performance were used. The test as performed by Albert et al. and Kristiansson et al. differed in that there was no stabilization of the side of the pelvis opposite to the side being tested. Albert et al. reported accuracy similar to that of our study. Depending on the subclassifications of PGP, the sensitivity for the posterior pelvic pain provocation test was 0.84–0.93 and the specificity was 0.98 [1]. The testers in the Albert et al. study had had numerous training sessions, but were not specially trained in manipulative techniques. In a longitudinal, prospective cohort study, the posterior pelvic pain provocation test (called the painful femoral compression test in this study) was evaluated in pregnant women [12]. The test result was analyzed both separately and in combinations of tests. The reported sensitivity for the test ranged between 0.47 and 0.69 and the specificity was 0.90. The multiple test score for the lumbosacral region had a sensitivity of 0.67 and a specificity of 0.84.

The aim of the study by Cook et al. was to test the reliability and validity of the classification described by Albert et al. However, the authors used the thigh thrust test [5]. The thigh thrust test is similar to the posterior pelvic pain provocation test, the difference being that the thigh thrust test includes an adduction of the hip and a thrust, rather than a light pressure, as in the posterior pelvic pain provocation test. The posterior pelvic pain provocation test also includes a stabilization of the pelvis over the anterior superior iliac spine on the side opposite to that being tested. The thigh thrust test was evaluated in nonpregnant populations and was found to have kappa values of 0.64–0.88 [11, 23]. Cooke et al. reported a sensitivity of 0.76 and a specificity of 0.67 for the thigh thrust test in women with PGP.

For classification of PGP, a multiple test score has been recommended in pregnant cohorts [12] and postpartum PGP [21], as well as for classification of sacroiliac joint pain in a nonpregnant population [10, 11, 14, 23]. It is thought that several structures may be affected, and if only one test is performed, the risk of missing the PGP/sacroiliac joint pain is greater. Two positive posterior pelvic pain provocation tests out of a total of eight have been proposed as the diagnostic criteria for PGP in pregnancy [26], and two out of four tests, three out of six tests [14] or three out of five tests for nonpregnancy-related sacroiliac joint pain [11]. Kokmeyer et al. (2002) discussed the superiority of a multiple test regime over a single test for the thigh thrust test that had shown the highest sensitivity [11]. A single thigh thrust test achieved a kappa coefficient of 0.67, while three out of five positive tests achieved a kappa coefficient of 0.70. However, the thigh trust test was positive in five asymptomatic patients, whereas a multiple test score of three out of five positive tests was found to be negative by both examiners for every asymptomatic subject. Consequently, the authors recommended a multiple test score. Their reasoning might be applicable in PGP as well.

Although controversial, a currently acceptable method of diagnosing a sacroiliac joint pain is the fluoroscopically guided, contrast-enhanced intraarticular anesthetic block [10], which has been suggested as a reference standard against which to compare pain provocation tests in a nonpregnant sample [14]. However, the blocks do not take into account the possibility that the pain originated from the extra-articular structures surrounding the sacroiliac joint. The choice of name for the pregnancy-related syndrome in the guidelines, pelvic “girdle” pain [25], was due to theories that ligaments and muscles may as well be the painful structures in patients with PGP. The posterior pelvic pain provocation test elicits a well-characterized, distinctly located pain, deep in the gluteal area on the ipsilateral side of the pelvis. The anatomical origin of the pain is unknown and probably involves several anatomical structures that each, or as a unit, can elicit pain reactions. Therefore, intraarticular anesthetic blocks are not ideal either.

It has been stated that patients with symptomatic discs may have false-positive sacroiliac joint pain provocation tests [13]. This was not confirmed for the posterior pelvic pain provocation test.

Based on current knowledge and existing guidelines [24, 25], a clinical evaluation of lumbopelvic pain should include: a standardized history, taking known characteristics of PGP as well as lumbar pain into account; pelvic pain provocation tests; a neurological examination; and the active straight leg-raising test. Clinicians should also be able to exclude lumbar pain and red flag signs. The validation process is never-ending, and further studies are needed to support the decision of whether to use only one or multiple test scores as a criterion for PGP.

Conclusions

This study shows that the posterior pelvic pain provocation test is negative in patients with a well-defined lumbar diagnosis. In this study, the diagnosis was CT-verified lumbar disc herniation before and after surgery. A further step toward more accurate classification of lumbopelvic pain has been taken.

Acknowledgment The authors declare that the study complies with the current laws of the country.

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